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## DRAFT

### Assessment of Qualification for Treatment under the Arizona Natural and Exceptional Events Policy for the High Particulate (PM<sub>10</sub>) Concentration Events in the Buckeye and Yuma Areas on March 2, 2008

#### Background

The Arizona Department of Environmental Quality (ADEQ) issues Dust Control Action Forecasts for the Yuma and Phoenix areas as part of their Natural Events Action Plans. On Friday February 29, 2008, in response to an approaching trough of low pressure, ADEQ air quality forecasters issued the Maricopa County Dust Control Action Forecast calling for a moderate risk of wind-blown dust for Sunday March 2<sup>nd</sup> for Maricopa County. In addition to the approaching trough, a cutoff area of low-pressure was forecast to move eastward, south of the Arizona border. In response to these systems, ADEQ air quality forecasters called for a high risk of wind-blown dust in their Yuma and Vicinity Dust Control Action Forecast for Sunday, March 2<sup>nd</sup>. The Forecast for Yuma called for northerly winds sustained at 25 mph and gusting higher. This potential wind-blown dust event equated to a significant risk of exceeding the PM<sub>10</sub> National Ambient Air Quality Standards (NAAQS) in both Yuma and Maricopa County. The forecasts/advisories satisfy the requirement in 40 CFR 51.920(a)(1).

Strong winds were observed throughout much of the state on March 2, 2008, with the strongest winds occurring in western and southwestern Arizona. The initialization of the wind-blown dust event is evident in the Phoenix visible camera images, particularly for the White Tank Mountains and Estrella Mountains, as well as the Arizona Meteorological Network (AzMET) and National Weather Service (NWS) monitors (see Fig. 1). All appropriate State Implementation Plan (SIP) control measures were in place during the event demonstrating, per 40 CFR 50.1(j), that the event “is not reasonably controllable or preventable.”

The significant wind event brought elevated ambient concentrations of PM<sub>10</sub> to the Yuma and Phoenix areas that exceeded the NAAQS at the Yuma Courthouse monitor operated by ADEQ as well as the Buckeye monitor operated by Maricopa County. The fact that ambient concentrations exceed the NAAQS satisfies the criteria in 40 CFR 50.1(j) that the event “affects air quality.” The following are the key PM<sub>10</sub> monitor readings for the monitors examined in this report:

Monitor (Operator/Type)	AQS ID	24-hr Avg PM <sub>10</sub>	1-hr Max PM <sub>10</sub>	Max Time	Flag**
<b>YUMA AREA</b>					
<b>Yuma Courthouse (ADEQ/BAM)</b>	<b>04-027-0004*</b>	<b>161</b>	<b>610</b>	<b>1200</b>	<b>A or RJ</b>
<b>BUCKEYE AREA</b>					
<b>Buckeye (Maricopa Co.[MC]/TEOM)</b>	<b>04-013-4011*</b>	<b>160</b>	<b>880</b>	<b>1400</b>	<b>A or RJ</b>
<b>PHOENIX METRO AREA</b>					
<b>West 43<sup>rd</sup> Ave (MC/TEOM)</b>	<b>04-013-4009*</b>	<b>45</b>	<b>178</b>	<b>1600</b>	None
<b>Durango Complex (MC/TEOM)</b>	<b>04-013-9812*</b>	<b>39</b>	<b>117</b>	<b>1800</b>	None
<b>Coyote Lakes (MC/TEOM)</b>	<b>04-013-4014*</b>	<b>25</b>	<b>87</b>	<b>2000</b>	None
<b>South Phoenix (MC/TEOM)</b>	<b>04-013-4003*</b>	<b>56</b>	<b>181</b>	<b>1800</b>	None

\* EPA Air Quality System Identification Number

\*\* 24-hr PM<sub>10</sub> concentration influenced by natural or exceptional event to be flagged.

Type Abbreviations: BAM – Beta-Attenuation Mass Monitor (Continuous monitor)

TEOM – Tapered Element Oscillating Microbalance Monitor (Continuous monitor).

The preliminary findings from this analysis will be presented at a stakeholders meeting on November 19, 2008, in Phoenix, Arizona. Following this stakeholders meeting, ADEQ will finalize this demonstration and solicit public

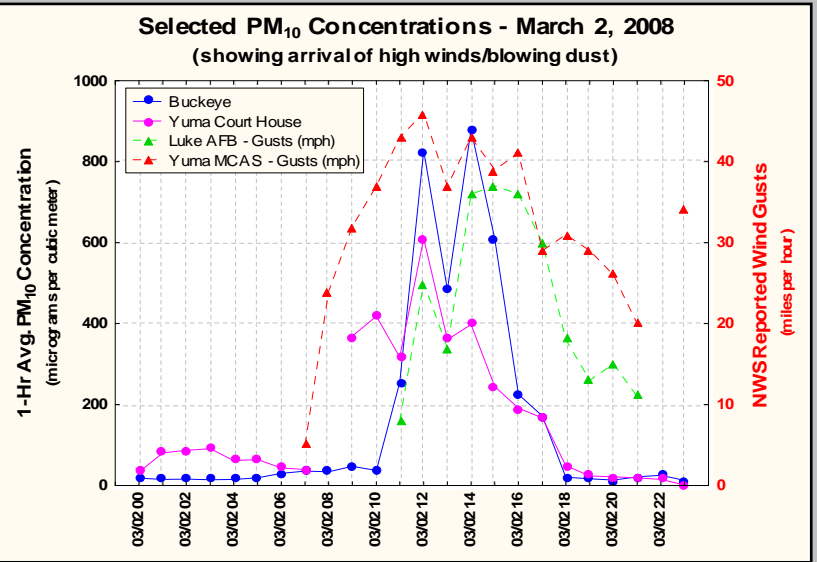
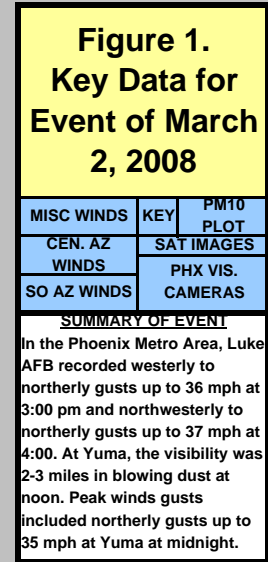
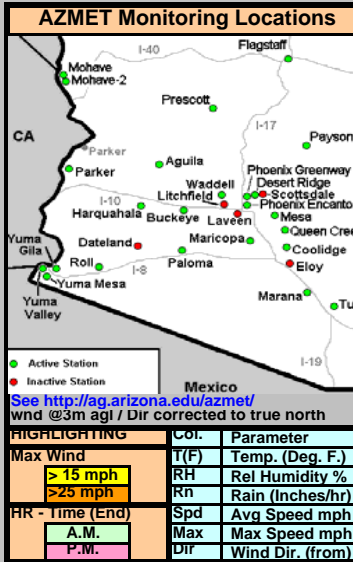
comment on the final demonstration. Any comments that are received will be forwarded to EPA with this demonstration pursuant to 40 CFR 50.14(c)(3)(i).

BUCKEYE							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
26-Buckeye	1	58	41	-	4	6	NW
	2	56	45	-	2	6	N
	3	53	57	-	3	6	NW
	4	52	55	-	3	8	N
	5	51	55	-	3	5	N
	6	51	55	-	2	5	SW
	7	48	64	-	1	4	NE
	8	46	73	-	4	7	NW
	9	53	60	-	5	8	NW
	10	60	53	-	4	7	W
	11	66	33	-	9	17	NW
	12	69	19	-	17	24	N
	1	69	11	-	19	29	N
	2	70	8	-	23	34	NW
	3	70	6	-	26	34	N
	4	69	6	-	25	36	N
	5	67	7	-	25	36	N
	6	65	9	-	22	34	N
	7	62	10	-	17	25	N
	8	60	11	-	17	24	N
	9	57	12	-	13	19	N
	10	56	12	-	14	20	N
	11	53	13	-	11	16	N
	12	50	17	-	10	14	N

NWS-LUKE AFB							
	Hr	T(F)	VR	Dust	Spd	Gust	Dir
NWS-LUKE AFB	1	61	10	-	9	9	SW
	2	60	10	-	0	0	N
	3	63	10	-	14	14	SW
	4	62	10	-	10	10	SW
	5	60	10	-	13	13	SW
	6	58	10	-	11	11	SW
	7	51	10	-	3	3	N
	8	52	10	-	3	3	W
	9	57	10	-	3	3	N
	10	62	10	-	3	3	N
	11	65	10	-	3	3	W
	12	68	10	-	8	8	SW
	1	70	10	-	17	25	W
	2	72	10	-	10	17	NE
	3	72	10	-	26	36	NW
	4	70	10	-	26	37	NW
	5	68	10	-	30	36	NW
	6	64	10	-	22	30	NW
	7	60	10	-	18	18	NW
	8	56	10	-	13	13	NW
	9	54	10	-	15	15	NW
	10	53	10	-	11	11	NW
	11	49	10	-	8	8	NW
	12	49	10	-	13	13	NW

NWS-YUMA MCAS							
	Hr	T(F)	VR	Dust	Spd	Gust	Dir
NWS-YUMA MCAS	1	63	10	-	0	0	W
	2	62	10	-	6	6	W
	3	59	10	-	6	6	W
	4	60	10	-	9	9	NW
	5	59	10	-	9	9	W
	6	57	10	-	7	7	NW
	7	57	9	-	7	7	W
	8	58	9	-	5	5	NW
	9	68	10	-	16	24	N
	10	71	4	-	21	32	N
	11	73	6	-	28	37	N
	12	75	3	-	29	43	N
	1	75	3	-	29	46	N
	2	75	4	BLDU	26	37	N
	3	74	3	BLDU	26	43	N
	4	74	9	BLDU	26	39	N
	5	73	8	BLDU	26	41	N
	6	71	10	BLDU	20	29	N
	7	68	10	BLDU	22	31	N
	8	66	10	BLDU	21	29	N
	9	66	10	BLDU	16	26	N
	10	64	10	BLDU	11	20	N
	11	64	10	BLDU	N/A	N/A	N
	12	64	10	BLDU	23	34	N

Event Contrib. Analysis				
Hourly PM <sub>10</sub> Conc. (µg/m <sup>3</sup> )				
MONITORS:		Hr	1	2
1-Buckeye		1	17.8	33.1
2-Yuma CH		2	15	80.7
24-Hr. Avg PM <sub>10</sub>		5	15	61.5
Monitor: Event		6	19.2	64.2
1-Buckeye		8	35.9	39.9
2-Yuma CH		9	33.9	33.9
> NAAQS		10	47.2	369
Pink=Event Contrib.		11	37.2	419
Conclusion: As shown above, the PM <sub>10</sub> concentration would have been below the NAAQS "BUT FOR" the event contribution (hours highlighted in pink).		12	254	317
		1	827	610
		2	484	361
		3	880	398
		4	610	245
		5	226	192
		6	172	167
		7	20.5	49.5
		8	16.8	24.2
		9	13.9	21.7
		10	21.4	19
		11	25.7	14.8
		12	13.1	2.2



PARKER							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
08-Parker	1	64	32	-	20	32	NW
	2	63	35	-	21	33	NW
	3	61	37	-	17	29	W
	4	60	39	-	15	22	NW
	5	59	38	-	17	28	NW
	6	61	27	-	18	30	N
	7	60	22	-	15	25	N
	8	59	22	-	14	22	N
	9	60	22	-	22	37	N
	10	62	19	-	29	40	N
	11	64	17	-	29	39	N
	12	66	15	-	26	35	N
	1	68	13	-	27	38	N
	2	68	13	-	26	37	N
	3	68	13	-	27	35	N
	4	67	14	-	26	33	N
	5	66	14	-	26	35	N
	6	64	15	-	23	33	N
	7	61	15	-	20	26	N
	8	59	16	-	16	23	N
	9	56	20	-	13	20	N
	10	51	27	-	8	16	N
	11	49	28	-	2	8	NE
	12	49	26	-	7	13	NE

W CEN AZ - AGUILA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
07-Aguila	1	47	55	-	3	7	NE
	2	47	53	-	3	6	E
	3	45	58	-	3	6	SE
	4	47	53	-	3	7	NW
	5	49	53	-	7	14	NW
	6	50	51	-	7	12	W
	7	50	51	-	7	12	NW
	8	52	47	-	7	18	N
	9	55	33	-	4	11	NW
	10	58	28	-	13	24	NW
	11	60	22	-	23	32	N
	12	62	12	-	26	36	N
	1	63	8	-	22	33	N
	2	63	7	-	23	32	N
	3	63	8	-	24	34	N
	4	62	9	-	22	31	N
	5	61	10	-	21	29	N
	6	59	12	-	21	29	N
	7	55	13	-	17	24	N
	8	53	14	-	16	23	N
	9	51	16	-	14	20	N
	10	49	18	-	13	18	N
	11	48	19	-	13	18	N
	12	43	65	-	3	7	E

MARICOPA							
	Hr	T(F)	RH	Rn	Spd	Max	Dir
06-Maricopa	1	56	47	-	6	9	S
	2	53	54	-	4	7	SE
	3	54	44	-	8	10	S
	4	52	46	-	6	9	S
	5	50	49	-	5	8	S
	6	49	52	-	4	6	S
	7	48	54	-	4	7	SW
	8	53	48	-	4	9	S
	9	59	39	-	6	11	SW
	10	64	33	-	7	13	NW
	11	66	30	-	6	11	W
	12	68	28	-	7	12	NW
	1	70	23	-	9	17	NW
	2	71	20	-	13	24	NW
	3	72	11	-	13	23	W
	4	72	11	-	12	18	NW
	5	70	9	-	16	24	NW
	6	67	8	-	18	25	NW
	7	62	10	-	16	24	NW
	8	59	11	-	12	21	N
	9	57	12	-	9	14	N
	10	54	15	-	6	12	N
	11	53	14	-	8	15	N
	12	53	15	-	8	14	N

Historical Distribution				
5-Yr. Dist. of Values (µg/m <sup>3</sup> )				
MONITORS:		Column Index		
1-BUCKEYE		Yr	All Data (5-Yrs)	
2-YUMA CH		Sea	Data for Spring season only (5-Yrs)	
Cum. Freq.	Mon 1	Mon 2		
5	7	8		
0.5%	7	12		
1.0%	9	14		
2.5%	13	16		
5%	16	19		
10%	22	23		
25%	33	31		
50%	48	42		
75%	67	57		
90%	83	77		

## Assessment under the Technical Criteria Document (TCD)

1. Properly qualify and validate the air quality measurement to be flagged. As this was not a filter sampling date (1-in-6 run day), only data from the continuous analyzers were examined. The air quality monitoring data were reviewed by the agency responsible for operation of the monitor. All hourly PM<sub>10</sub> readings from the Buckeye and Yuma Courthouse monitors were valid for March 2<sup>nd</sup>. Audits of the analyzers revealed operations were within acceptable tolerance. No local sources were reported as significantly contributing to the air quality episode. Exceedances of the NAAQS were recorded at the Yuma Courthouse monitor operated by ADEQ and the Buckeye monitor operated by Maricopa County.

2. Review suspected contributing sources. The NWS and AzMET surface data for Arizona, along with the visible camera images in Phoenix, provide a good explanation as to the meteorological conditions that were in place on March 2<sup>nd</sup>. Strong northerly down-river winds were occurring in the Yuma area starting during the mid-morning hours and continuing through the evening due to the passing of a low pressure frontal boundary. For the rest of the State, strong north-northwesterly winds associated with the frontal system were reported throughout the afternoon. The plot of hourly PM<sub>10</sub> concentration data in the upper right corner of Figure 1 confirms the timing of elevated PM<sub>10</sub> concentrations occurring first at the Yuma Courthouse monitoring site followed two hours later by PM<sub>10</sub> concentrations at the Buckeye site.

3. Examine all air quality monitoring information. Data from all monitors in the network were reviewed. Monitors from the affected areas are summarized in the table in the Background section of this assessment. Pursuant to 40 CFR 50.14(c)(3)(iii)(C), the "Historical Distribution" Table in Figure 1 has been included to demonstrate that the event is associated with measured concentrations in excess of normal historical fluctuations, including background (i.e., concentrations greater than the 95<sup>th</sup> percentile). Monitors with readings greater than that of the NAAQS on March 2<sup>nd</sup>, 2008, which should be flagged, include the Yuma Courthouse and Buckeye monitors.

4. Examine the meteorological conditions before and during the event. The AzMET meteorological data are summarized in Figure 1. The wind data are highlighted yellow if the max wind speed in the hour exceeds 15 mph and orange if it exceeds 25 mph. Yuma experienced hourly

max wind speeds greater than 15 mph beginning during the 8 o'clock hour and continuing through the rest of the day, with portions of the morning, the entire late afternoon, and evening having hourly max wind speeds greater than 25 mph. As can be seen in Figure 1, wind speeds did not pick up in central Arizona until approximately 11 a.m., when several stations reported gusty winds that approached 40 mph at times. This timing corresponds to the onset of elevated PM<sub>10</sub> concentrations recorded at Buckeye.

5. Perform a qualitative attribution to emission source(s). All evidence indicates the elevated PM<sub>10</sub> concentrations in the Yuma and Phoenix areas can be attributed to soil emissions that were transported over a broad area. No source-specific emission allocation is possible based on the data available for analysis. The hourly concentration data do not show any significant source other than the wind-blown dust event occurring on March 2<sup>nd</sup>. Observational reports of blowing dust from trained officials in Yuma, along with reduced visibility, provide further proof that the elevated PM<sub>10</sub> concentrations in the Yuma area were attributed to soil emissions. These reports, in addition to the visual evidence of reduced visibility most clearly seen in the 3:00 p.m. images for the White Tank and Estrella Mountains located in the lower right portion of Figure 1, provide proof that elevated PM<sub>10</sub> concentrations in Phoenix are attributable to soil emissions.

6. Estimation of Contribution from Source or Event. The primary source appears to be wind-blown dust over central and southwestern Arizona for which there is not an effective or efficient method to estimate the relative contributions from specific sources. The demonstration analysis contained in this report establishes the linkage between the measurements to be flagged and the event, thus satisfying a 40 CFR 50.14(c)(3)(iii)(B) requirement. Pursuant to 40 CFR 50.14(c)(3)(iii)(D), the "Event Contrib. Analysis" Table in Figure 1 has been included to demonstrate that there would have been no exceedances or violations but for the event (i.e., the contribution during the event overwhelmed the 24-hour averages).

7. Determination that a Natural or Exceptional Event Contributed To an Exceedance. Based on this analysis, the event satisfies the requirement in 40 CFR 50.1(j) that the elevated concentrations at the Yuma Courthouse and Buckeye monitoring sites were attributed to a natural event.

## Conclusion

Long-range transport of dust from soils. The region wide elevated PM<sub>10</sub> event on March 2, 2008, in Yuma and Maricopa County was the result of the transport of dust and soils from winds that suspended natural soils and soils from areas where Best Available Control Measures are in place

and should be flagged for air quality planning purposes. The "high wind" flag (A or RJ) should be applied to the monitor readings indicated in the table at the beginning of this report, as the monitor would have been below the NAAQS but for the contribution of the event.